

REMARKS

Claim 3 has been amended and Claims 1, 2 and 5 have been cancelled. Support for the amendment can be found generally throughout the specification. Applicants respectfully submit that no new matter has been added by the present amendment.

I. Objections

The Office Action objects to the disclosure and states that the title of the invention should be removed from the abstract page. Applicants have reviewed 37 C.F.R. 1.72(b) and respectfully submit that it is not improper to have the title of the invention on the abstract page. According, Applicants request the Examiner either withdraw this ground of rejection or kindly supply Applicants with a citation to authority requiring such amendment.

II. Rejection under 35 U.S.C. §103(a).

Claims 1 and 2 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pelzer, et al. (U.S. Patent No. 5,585,091). Claims 1 and 2 have been cancelled for reasons unassociated with the cited reference and accordingly, Applicants respectfully submit that the present rejection is moot.

III. Rejection under 35 U.S.C. §103(a).

Claims 1-9 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pelzer, et al. (U.S. Patent No. 5,585,091) and further in view of Wang, et al. (Paper American Chemical Society, 220th, POLY-416, 03-2000) and further in view of Heywang, et al. (U.S. Patent No. 5,473,079). According to the Office Action Pelzer, et al. teaches a process for the synthesis of phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt in which o-phenylenediamine is reacted with

terephthalic acid, chlorosulfonic acid and concentrated sulfuric acid. The Office Action also states that Pelzer, et al. teaches a solution of the product of the reaction in water at 80°C and treatment with activated carbon with heating. Further, the Office Action states that the claimed repetition of the treatment with activated carbon is obvious over Pelzer, et al.'s teaching of the first treatment since it would require only routine experimentation by one of ordinary skill in the art to determine whether the first treatment was incompletely successful in the removal of susceptible impurities. According to the Office Action, Pelzer, et al. additionally teaches the formation of the sodium salt via treatment with sodium hydroxide solution and the precipitation of the product by acidification with sulfuric acid. The Office Action admits that Pelzer, et al. is silent with regard to the extension of the reaction period, however the Office Action states that it would have been obvious to one of ordinary skill in the art to modify the process of Pelzer, et al. by extending the reaction time to complete the sulfonation of the product that Pelzer, et al. teaches contains 1% of the product of incomplete sulfonation. The Office Action also admits that Pelzer, et al. is silent with regard to the use of sodium chloride in the neutralization/precipitation step.

The Office Action continues and states that Wang, et al. teaches the sulfonation of aromatic compounds and the generation of the corresponding sodium sulfonate salts via neutralization with a mixture of sodium chloride and sodium hydroxide. Although, the Office Action states that both Wang, et al. and Pelzer, et al. are silent with regard to acidification in the second step to pH 3 with hydrochloric acid. The Office Action states that Heywang, et al. teaches a closely related process of the synthesis of 2-phenylbenzimidazole-5-sulfonic acid and the

acidification to pH 3 with hydrochloric acid to produce the final product. Applicants respectfully traverse this ground of rejection.

Newly amended Claim 3 is directed to a process for the preparation of phenylene-bis-benzimidazole-tetrasulfonic acid di-sodium salt comprising the step of reacting o-phenylene-diamine with terephthalic acid and chlorosulfonic acid in the presence of strong acids, wherein the reaction time is 10 to 15 hours and wherein the phenylene-bis-benzimidazole-tetrasulfonic acid obtained in the reaction is, in a first step, dissolved in water and treated with activated carbon, which is then separated off, and where the phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt is precipitated out by adding sodium chloride and separated off and, in a second step, is again dissolved in water and again treated with activated carbon, which is then again separated off, where pure phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt precipitates out of the filtrate by acidification and is then optionally also purified. Claim 4 is dependent upon Claim 3 and recites that the phenylene-bis-benzimidazole-tetrasulfonic acid obtained in the reaction is dissolved in the first step in water in the temperature range from 40 to 80°C. Claim 6 is also dependent upon Claim 3 and recites that the phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt obtained in the first step is dissolved in the second step in water in the temperature range from 30 to 80°C. Claim 7 is dependent upon Claim 3 and claims that the phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt obtained in the first step is dissolved in the second step in water and, after treatment with and removal of the activated carbon, is precipitated out by acidification to about pH 3. Claim 8 is dependent upon Claim 1 and recites that the acidification in the second step is carried out with hydrochloric

acid. And Claim 9 is also dependent upon Claim 3 and claims that the phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt obtained in the second step is washed with phosphoric acid.

A. Rejection Over Pelzer, et al. Alone

The Office Action states it is it would be obvious to one of ordinary skill in the art to modify the process of Pelzer, et al. by extending the reaction time to complete the sulfonation of the product that Pelzer, et al. teaches contains 1% of the product of incomplete sulfonation. However, as admitted by the Office Action, Pelzer, et al. does not teach or suggest extending the reaction time, especially not extending the reaction time by over 9 and half hours (570 minutes).

The Office Action has not supplied any evidence that it is well known in the art that by extending the reaction time by over 200% would result in the production of phenylene-bis-benzimidazole-tetrasulfonic acid di-sodium salt, which is high in purity and which does not contain any byproducts which would cause discoloration. Further, no motivation has been provided for modifying the reaction period of Pelzer, et al. to achieve the present invention. Applicants respectfully submit that “[t]he teachings or suggestions to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicants’ disclosure.” See MPEP § 2142, citing In re Vaeck, 947 F.2d 488, 20 USPQ 2d. 1438 (Fed. Cir. 1991). Accordingly, Applicants request the Examiner cite a reference in support of such well-known knowledge in the art to greatly extend a reaction period with the expectation of success. Therefore, the Office Action has not made a prima facie case of obviousness with regard to the present claims.

Rejection Over Pelzer, et al. In View of Wang, et al.

The Office Action states that while Pelzer, et al. is silent with regard to the use of sodium chloride in the neutralization/precipitation step, Wang teaches the sulfonation of aromatic compounds and the generation of the corresponding sodium sulfonate salts via neutralization with a mixture of sodium chloride and sodium hydroxide.

As previously discussed above, Pelzer, et al. discloses a process for preparing phenylenebisbenzimidazoletetrasulphonic acid. However, Pelzer, et al. does not teach or suggest a process for the production of phenylene-bis-benzimidazole-tetrasulfonic acid di-sodium salt, wherein the process has a reaction time of at least 10 hours and uses sodium chloride in the neutralization/precipitation step.

The deficiencies of Pelzer, et al. are not overcome by the combination of Pelzer, et al. and Wang, et al. First Applicants submit that Wang, et al. discloses the synthesis of disodium 3,3'-disulfonate-4,4'-difluorodiphenylsulfonate, not phenylenebisbenzimidazoletetrasulphonic acid. Second, Applicants respectfully point out that Wang, et al. does not teach or suggest an extended reaction time for the production of phenylenebisbenzimidazoletetrasulphonic acid. Thirdly, Applicants respectfully point out that Wang, et al. discloses preparing 3,3'-disulfonate-4,4'-difluorodiphenylsulfonate via the sulfonation of 4,4'-difluorodiphenylsufone with fuming sulfuric acid and neutralization with sodium chloride and sodium hydroxide. Wang, et al. does not teach or suggest the complex purification process of the present invention, and accordingly Wang, et al. does not

teach or suggest that phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt is precipitated out by adding sodium chloride and separated off after the phenylene-bis-benzimidazole-tetrasulfonic acid obtained is dissolved in water and treated with activated carbon. Therefore, Applicants respectfully submit that the combination of Pelzer, et al. and Wang, et al. does not teach all the claim limitations and accordingly Applicants request withdrawal of this ground of rejection.

Rejection Over Pelzer, et al. In View of Wang, et al. and Heywang, et al.

The Office Action states that both Wang, et al. and Pelzer, et al. are silent with regard to acidification in the second step to pH 3 and that Heywang, et al., however, teaches a closely related process and the acidification to pH 3 with hydrochloric acid.

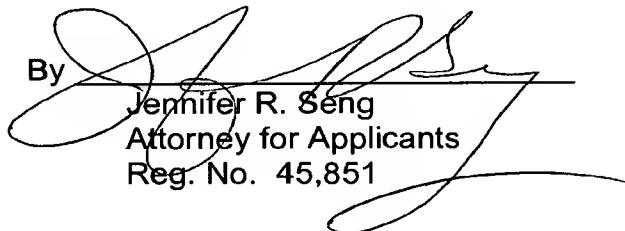
The deficiencies of Pelzer, et al. are not overcome by the combination of Pelzer, et al. and Wang, et al. and Heywang, et al. First, Applicants submit that Heywang, et al. discloses the synthesis of 2-arylbenzimidazole-5-sulfonic acid, not phenylenebisbenzimidazole **tetrasulphonic acid**. Second, Applicants respectfully submit that Heywang, et al. does not teach or suggest the multi-step process of the present invention, but rather teaches away from such a process by disclosing a **single-step process** comprising reacting o-phenylenediamine in a solvent in the presence of sulfuric acid. Accordingly, Applicants respectfully submit that since Heywang, et al. teaches away from the present invention, one skilled in the art would not be motivated to modify the process of Wang, et al. or Pelzer, et al. to include acidification to pH 3 with hydrochloric acid. Accordingly, Applicants respectfully request withdrawal of this ground of rejection.

For at least the reasons provided above, Applicants respectfully submit that the claims are not rendered obvious by Pelzer, et al., either alone or in combination with Wang, et al. and Heywang, et al.. Therefore, Applicants respectfully request reconsideration and withdrawal of these grounds of rejection under 35 U.S.C. §103(a).

Applicants maintain that the claims are in condition for allowance. Early and favorable consideration is earnestly solicited. If the Examiner believes any informalities remain in the application that may be corrected by Examiner's Amendment, or there are any other issues that can be resolved by telephone interview, a telephone call to the undersigned attorney at (412) 777-8356 is courteously solicited.

Respectfully submitted,

By



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

Please Cancel Claims 1, 2 and 5 without prejudice or disclaimer.

Please amend Claim 3 as follows:

3. (Amended) ~~A process according to Claim 1,~~ A process for the preparation of phenylene-bis-benzimidazole-tetrasulfonic acid di-sodium salt comprising the step of reacting o-phenylene-diamine with terephthalic acid and chlorosulfonic acid in the presence of strong acids, wherein the reaction time is 10 to 15 hours and wherein the phenylene-bis-benzimidazole-tetrasulfonic acid obtained in the reaction is, in a first step, dissolved in water and treated with activated carbon, which is then separated off, and where the phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt is precipitated out by adding sodium chloride and separated off and, in a second step, is again dissolved in water and again treated with activated carbon, which is then again separated off, where pure phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt precipitates out of the filtrate by acidification and is then optionally also purified.